

REMARKS

I. Introduction

By the present Amendment, claims 1, 3, and 8-10 have been amended. No claims have been added or cancelled. Accordingly, claims 1 and 3-11 remain pending in the application. Claims 1, 3, and 8-10 are independent.

II. Office Action Summary

In the Office Action of December 11, 2007, claim 9 was rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 6,180,372 issued to Franzen. Claims 1, 7, and 8 were rejected under 35 USC §103(a) as being unpatentable over Franzen in view of U.S. Patent Application No. 2006/0011478 to Fouillet. Claims 3-6, 10, and 11 were rejected under 35 USC §103(a) as being unpatentable over Franzen in view of Fouillet and further in view of U.S. Patent Application No. 2005/022137 to Enzelberger. These rejections are respectfully traversed.

III. Interview

Applicants would like to thank Examiner Bowers for the cooperation and courtesy extended during the interview conducted on March 5, 2008. During the interview, Applicants discussed the features of the invention with respect to the pending claims, as well as the differences from the cited references. In particular, Applicants noted that none of the cited references disclosed an arrangement containing a plurality of different second set temperatures that ranged from 55°C to 62°C. Applicants further indicated that each of the second set temperatures were maintained at a specific level which differed from the remaining second set temperatures. The Examiner indicated that such a feature did not appear to be

clearly recited in the claims. Applicants agreed to amend the claims in order to better clarify these features. Various suggestions were discussed for clarifying the claim language but no agreement was reached on the specific wording for the amendments. It was further agreed that the arrangement discussed during the interview was not disclosed or suggested by the art of record. The Examiner indicated that further searching and consideration would be necessary in light of any such amendments.

IV. Rejections under 35 USC§102

Claim 9 was rejected under 35 USC §102(b) as being anticipated by Franzen. Regarding this rejection, the Office Action alleges that Franzen discloses a nucleic acid amplifying method that comprises a branch step for branching a reaction fluid containing a sample of nucleic acid and reagent. The Office Action also indicated that Franzen discloses a flow passage that includes a branch portion which creates a plurality of parallel fluid passages, and that the branched reaction fluid parts are repeatedly heated and cooled at a plurality of different temperatures. Applicants respectfully disagree.

By the present Amendment, Applicants have amended independent claim 9 to better define the claimed invention based on discussions and suggestions made during the interview. As amended, independent claim 9 now defines a nucleic acid amplifying method that comprises:

a branch step for branching a reaction fluid containing a sample containing a nucleic acid and a reagent being mixed with the sample;

a repeated heating and cooling step for repeatedly heating and cooling the branched reaction fluid parts between a first set temperature and a second set temperature; and

a junction step for joining the plurality of branched reaction fluid parts that have been repeatedly heated and cooled;

wherein the first set temperature is 95°C, and the second set temperature is provided as a temperature gradient ranging from 55°C to 62°C with eight temperature zones that are sequentially set at intervals of 1°C.

According to the method of independent claim 9, a branch step is provided for branching a reaction fluid that contains a sample of nucleic acid and a reagent being mixed with the sample. The reaction fluid is repeatedly subjected to a heating and cooling process between a first set temperature and a second set temperature. A junction step is performed to join the branched reaction fluid parts that have been repeatedly heated and cooled. According to independent claim 9, the first set temperature is fixed at 95°C. The second set temperature is provided as a temperature gradient ranging from 55°C to 62°C. This temperature gradient includes eight separate temperature zones that are sequentially set at intervals of 1°C. This feature is discussed, for example, at page 19, lines 11-17 of the Specification. Thus, each of the temperature zones in the second set temperature differ from each other.

As discussed during the interview, Franzen does not disclose all of the features of the claimed invention. Franzen discloses a method for DNA replication, but utilizes conventional heating and cooling techniques. Franzen discloses three different set temperatures but never provides a temperature gradient which ranges from 55°C to 62°C at 1°C intervals. Consequently, during the cooling process of Franzen, the fluid is not subjected to all of the temperatures in the second set temperature range, as in the claimed invention. Franzen simply fails to provide any disclosure or suggestion for features recited in independent claim 9, such as:

wherein the first set temperature is 95°C, and the second set temperature is provided as a temperature gradient ranging from

55°C to 62°C with eight temperature zones that are sequentially set at intervals of 1°C.

It is therefore respectfully submitted that independent claim 9 is allowable over the art of record.

Claims 1, 7, and 8 were rejected under 35 USC §103(a) as being unpatentable over Franzen in view of Fouillet. Regarding this rejection, the Office Action relies on Franzen for disclosing a nucleic acid amplifying apparatus that comprises most of the features recited in the claims. The Office Action admits that Franzen does not expressly disclose a plurality of set temperature zones provided by a first and second heating mechanism, but relies on Fouillet for disclosing such features. Applicants respectfully disagree.

By the present Amendment, Applicants have amended independent claim 1 to define a nucleic acid amplifying apparatus that comprises:

- a flow passage, through which a reaction fluid containing a sample containing a nucleic acid and a reagent flows, said flow passage including,

- a flow passage branch portion, at which the flow passage branches into a plurality of branch flow passages,

- a junction portion, at which the plurality of branch flow passages join, and

- a joined flow passage, through which the reaction fluid as joined is conducted;

- a first heating mechanism having a plurality of first set temperature zones of 95°C provided on the branch flow passages;
- and

- a second heating mechanism provided on the branch flow passages, said second heating mechanism including eight second set temperature zones forming a temperature gradient ranging from 55°C to 62°C with each of the second set temperature zones being sequentially set at intervals of 1°C;

- wherein the branch flow passages are arranged so as to repeatedly pass through the first and second set temperature zones.

The apparatus of independent claim 1 includes a flow passage through which a reaction fluid containing nucleic acid and a reagent flow. The flow passage includes a flow passage branch portion, a junction portion, and a joined flow passage. The flow passage branches into a plurality of flow branch passages at the flow passage branch portion and these flow branch passages are rejoined at the junction portion. The joined flow passage is used to transport the reaction fluid as it is being joined at the junction portion. A first heating mechanism is provided on the branch flow passages with a plurality of first set temperature zones. Each first temperature zone in the first heating mechanism is controlled to be 95°C. According to independent claim 1, a second heating mechanism is provided on the branch flow passages. The second heating mechanism includes eight second set temperature zones that form a temperature gradient ranging from 55°C to 62°C. Each of the second set temperature zones is sequentially set at intervals of 1°C. Furthermore, the branch flow passages are arranged such that they repeatedly pass through the first and second set temperature zones. As previously discussed, Franzen fails to provide any disclosure or suggestion for a second heating mechanism having eight different temperature zones. Furthermore, Applicants' review of Fouillet has failed to provide any disclosure or suggestion for such a feature. Consequently, these references fail to provide any disclosure or suggestion for features now recited in independent claim 1, such as:

a second heating mechanism provided on the branch flow passages, said second heating mechanism including eight second set temperature zones forming a temperature gradient ranging from 55°C to 62°C with each of the second set temperature zones being sequentially set at intervals of 1°C;

wherein the branch flow passages are arranged so as to

repeatedly pass through the first and second set temperature zones.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claim 7 depends from independent claim 1, and is therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, this claim introduces novel elements that independently renders it patentable over the art of record.

As amended, independent claim 8 defines a chemical analysis apparatus that comprises:

- a flow passage, through which a reaction fluid containing a sample containing a nucleic acid and a reagent being mixed with the sample flows, said flow passage including,

- a flow passage branch portion, at which the flow passage branches into a plurality of branch flow passages,

- a junction portion, at which the plurality of branch flow passages join together,

- a joined flow passage, through which the reaction fluid as joined is conducted, and

- a detection part that detects the nucleic acid in the reaction fluid conducted to the joined flow passage; and

- a first heating mechanism having a plurality of first set temperature zones of 95°C provided on the branch flow passages; and

- a second heating mechanism provided on the branch flow passages, said second heating mechanism including eight second set temperature zones forming a temperature gradient ranging from 55°C to 62°C with each of the second set temperature zones being sequentially set at intervals of 1°C;

wherein the heating mechanism is formed such that the branch flow passages repeatedly pass through the plurality of set temperature zones.

The chemical apparatus of independent claim 8 has been amended in a manner similar to independent claim 1. Specifically, the second set temperature zone is provided in the form of a temperature gradient ranging from 55°C to 62°C with each of the second set temperature zones being sequentially fixed at intervals of 1°C. As previously discussed, the combination of references simply fails to provide any disclosure or suggestion for such features. It is therefore respectfully submitted that independent claim 8 is allowable over the art of record.

Claims 3-6, 10, and 11 were rejected under 35 USC §103(a) as being unpatentable over Franzen in view of Fouillet and further in view of Enzelberger. By the present Amendment, Applicants have amended independent claims 3 and 10 to define a second heating mechanism and second set temperature zones similar to the manner in which independent claims 1, 8, and 9 have been amended.

Specifically, independent claim 3 now recites, in part:

a first heating mechanism having a plurality of first set temperature zones of 95°C provided on the first branch flow passages; and

a second heating mechanism provided on the second branch flow passages, said second heating mechanism including eight second set temperature zones forming a temperature gradient ranging from 55°C to 62°C with each of the second set temperature zones being sequentially set at intervals of 1°C.

As previously discussed, these features are not shown or suggested by the art of record.

It is therefore respectfully submitted that independent claim 3 is allowable over the art of record.

Claims 4 and 6 depend from independent claim 3, and are therefore believed allowable for at least the reasons set forth above with respect to independent

claim 3. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Independent claim 10 has also been amended to define a nucleic acid amplifying method that comprises, in part:

a first repeated heating and cooling step for repeatedly heating and cooling the branched reaction fluid parts between a first set temperature and a second set temperature, wherein the first set temperature is 95°C, and the second set temperature is provided as a temperature gradient ranging from 55°C to 62°C with eight temperature zones that are sequentially set at intervals of 1°C,

As previously discussed, such features are not shown or suggested by the art of record.

It is therefore respectfully submitted that independent claim 10 is allowable over the art of record.

Claim 11 depends from independent claim 10, and is therefore believed allowable for at least the reasons set forth above with respect to independent claim 10. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

V. Conclusion


For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 500.43725X00).

Respectfully submitted,
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